East Waterway OU

Anthropogenic Background Small Working Group Meeting #5

Invitees: EPA, East Waterway Group (Port of Seattle, City of Seattle, and King County) Muckleshoot Tribe, Suquamish Tribe

December 9, 10 – 11:30 am

Agenda

1. AB Dataset
    a. Dioxin/Furan Congener Selection
    b. 95UCL Statistic
2. Fines Normalization
3. Arsenic Discussion Continued
4. Sensitivity Analysis Observations
5. Memorandum Outline
6. Large Group Meeting Presentation

Attachments

Small Group Meeting #5 presentation

Attendees

EPA

- Ravi Sanga
- Elizabeth Allen

USACE (on behalf of EPA)

- Bill Gardiner

Suquamish Tribe

- Alison O'Sullivan

East Waterway Group (EWG)

- Brick Spangler (Port of Seattle)
- Jeff Stern (King County)
- Debra Williston (King County)
- Pete Rude (City of Seattle)
- Merv Coover (ERM on behalf of the City)
- Dan Berlin (Anchor QEA on behalf of EWG)
- Greg Brunkhorst (Anchor QEA on behalf of EWG)
- Deb Chiavelli (Anchor QEA on behalf of EWG)

Meeting Notes

Dan: This is our last meeting before the large group meeting in January. We would like to achieve resolution on whatever we can during this meeting.

Ravi: We are interested in following up the discussion on fines and dioxins. We didn't have any concerns with the items presented at the last meeting, so that's why there was no further update from EPA.

Debra: when we finish today the idea is we are bringing this to the large group to get a buyoff before the memo, correct?

Ravi: I wouldn't say buyoff, but Ecology will be at the meeting. The first draft of the memo will be for EPA review. The tone of the large group meeting will be to present what we are discussing and what we agree on, and to be open and transparent about what we are still working on. We have had the tribes participate, which is great. With EPA's upper management, it should be more of a tone to describe that here is where we are. I don't think we should look for approval from the larger group.

Debra: appreciate the clarification

Bill: when we write the memo, I'm guessing we won't have small group meetings, but something may be moving back and forth. Can we talk about what we discuss before the large group meeting?

Debra: yes at the end of this presentation, we are planning on talking about that

Ravi: Bill do you agree with me on the large group meeting plan?

Bill: yes I agree, I agree it should be a high level briefing of our progress. I wouldn't want to delay that meeting, but we will have the understanding about whether the large group wants something

Dan: we made a few small edits to the presentation this morning and we will send out the slightly revised presentation after the call

Greg [Slide 2]: reviewed outline.

Debra [Slide 4]: on Friday, we talked about the 4 primary congeners that make up the largest contribution to dioxin/furan (D/F) TEQ in fish and crab tissues. We pulled that info from Appendix C of the SRI. This slide cites figures for that data, and I think Table C.3-2 may be the table that Elizabeth was looking at to discuss the percentages that show 80-93% for how much of these 4 congeners contribute to the TEQ. Appendix C focused on fish and crab tissues as clam/geoduck tissues had very low detections.

[Slide 5]: there was a question from you about % of risk in congeners. This is not something we can grab quickly, we have to calculate the risks as individual congeners, as the risk assessment did it using dioxin/furan TEQ, so we have to look at that to tell you for sure if these 4 make up majority of risk. I expect they do but we have to factor in ingestion rates for different tissue types, so that will take some time. We will try to get that done by the end of the week.

Bill: I think that's fine. The 4 that you have will probably be what we end up with based on the work done to date, so I don't think it's a problem that we don't have that right now.

Debra: we always start with the risk-based numbers as the floor, and if background is above risk-based, guidance states you should use background as cleanup level over risk-based, as site concentrations will equilibrate to background. Appendix C is specific to D/F TEQ, not for individual congeners. We have to pull out the congener-specific RBTCs in sediment so we can compare to AB values for each congener to make sure AB values are above RBTCs. If a RBTC is above, the RBTC would be used instead of background to establish a cleanup level. We should have that by Friday. It will be a part of the memo but we're trying to get info to you early

Bill: is that process using the BSAFs for individual D/F congeners?

Debra: yes, we did that in Appendix C under EPA guidance. We developed BSAFs for those 4 congeners. We converted to a full TEQ in the appendix, because we needed a riskbased TEQ value so we could compare to natural background D/F TEQ in the FS. So that table in appendix C is sediment RBTCs based on the full D/F TEQ.

Bill: if we use a D/F RBTC that is derived from a BSAF, we would have to acknowledge the lack of confidence in BSAF vs. the background value that has gone through a process and that we have a lot of confidence in.

Elizabeth: what conversations are you talking about?

Bill: using the BSAFs to get from the tissue to the sediment

Debra: they were developed using site-specific data under EPA guidance and that document has been approved. Sorry we couldn't get this work done in time, but are trying to have it by the end of the week.

Elizabeth: I think the concept, at this time, is more important. No apology needed.

Ravi: I agree

Greg [Slide 6]: this table shows updated results. This table shows what proUCL is selecting for distributions. The 4 D/F congeners do have KM statistics since there were some nondetects, but arsenic and PCBs have detects for all samples. This is mostly reference. I'll move on if no questions.

Debra: I thought a goal was to make sure we are all in agreement with the UCL calculation methodology?

Greg: are there any issues with this methodology from EPA, or does this seem reasonable?

Elizabeth: I don't have any issues with it. What do you mean Debra?

Debra: Greg, are we now using pro-UCL for all of these? Sometimes proUCL does some weird things.

Elizabeth: I don't have any objection for how to calculate UCL or whether or not you use ProUCL. I am also fine using the R statistical software. As long as you use a robust method, I'm OK. ProUCL is a tool, but there is no prescription.

Ravi: Alison, do you see this table, and are you OK with everything there?

Alison: I see it and I don't have anything.

Ravi: maybe you want to talk with Denise

Alison: did you send me this table?

Ravi: it should be in the presentation

Greg [Slide 8]: since last meeting, we have conducted a new fines normalizing method using surface area. We may not be able to get into a detailed discussion, but we can follow up if there are questions after the meeting. The first bullet shows the previous fines normalization method, which had two assumptions 1) it assumed that contamination was 100% associated with the fines and 2) that settling in the EW is fine-grained sediment. The second bullet describes the surface area method and how it addresses those assumptions.

Jeff: I'm not sure I'd characterize this as a fines-normalization calculation. It's really normalizing to the organic carbon on the particle rather than normalizing to the fines.

Greg: Thanks, Jeff. Fines have higher concentrations than sands, so physically that ends up being proportional of the size of the particle compared to the mass. This figure shows surface area compared to mass on the x axis and % organic carbon on the y axis. We do see a very good relationship. This does allow sand to have some contamination associated with it, but it's proportional to the surface area of the sand. The last bullet addresses what is making it to the EW.

We have 4 particle sizes from the LDW sediment transport model that describes what particles enter the EW. Any questions?

Elizabeth: on the first bullet, I don't think we're assuming that contamination is associated with 100% of fine-grained sediment. The assumption for the EW is that fine grained sediments only get there. We have never assumed that contaminants are not on sand.

Merv: that is the effect of the normalization the way we had done it, which is what we meant.

Greg: yes, that is an assumption that we made with the first calculation method, which is a drawback

Bill: so that's what you're hoping to rectify with this method

Jeff: exactly

Greg [Slide 9]: Looking at the top portion, the first 2 classes (1a and 1b) are fines. Classes 2 and 3 are sands. This is from the LDW STM. This shows what is entering the LDW from the Green and also what is entering the EW. This shows the percent of mass in each category. A higher percentage of the fines exits the LDW and enters the EW.

Jeff: The reason we have 4 class sizes in the LDW STM is that this represents the upstream dataset from all of the data collected over several thousand samples of particle size distributions from the USGS sampling to estimate what is coming downstream as TSS. We broke the data into quartiles, and these class sizes represent the mean size class of each quartile. You could break it down further, but model run time goes up exponentially with each additional class, so we went with 4. This dataset was collected at Auburn in the past.

Merv: So the mass percentages are data driven?

Jeff: the mass percentages come out of the calibrated model run which best matches the bedded sediment particle distribution that settles throughout the LDW.

Merv; the surface areas are calculations based on the diameters?

Jeff: yes, of just those class sizes.

Greg: correct, the median diameters. The lower set of tables shows the same information but just chemistry data. It takes the same linear relationship between organic carbon and the surface area of particles to develop a weighted average of what you expect concentrations to be within each particle size class. This is a spreadsheet model, and the 17 ug/kg for PCBs is an input (which is the average of our data).

Debra: when you say "our data", you mean the AB suspended solids data mean?

Greg: yes. This assumes that the concentrations don't change, but that the change in mass that makes up the load that is traveling through the system changes once you get to the EW, as only fines enter the EW. So, this makes a big difference for PCBs, which goes from 17 to 37 ug/kg, and for D/F goes from 5.8 to 17 ng/kg TEQ. Any questions?

Elizabeth: So this is using the sediment transport model for LDW. Is this the first time you've done this, or is it documented elsewhere? Was this general concept part of the way the model was run to assess the natural recovery on the site?

Jeff: yes, the purpose for the model run, once it was all calibrated with a ten year spin up, was to generate a new LDW sediment bed and this result gave the best match to the existing particle size distribution in the LDW data. Then we used the model to predict how things changed over time and into the future. But in those runs, you have to follow class sizes individually in the model. The model starts many miles upstream, then here's the particle size distribution entering the LDW, then here's what it looks like leaving the LDW. This is the long-term average (the model run is for 30 years) of what is entering the waterway, but it does not address what is actually settling in the East Waterway.

Greg: this top graphic represents the information from the LDW STM

Jeff: yes the average of 30 years of runs

Greg: the lower tables were performed for this purpose, but the top tables have been presented in the past.

Jeff: there was something like this that was performed as part of a bounding run for the bed composition model (BCM) to look at particle size distribution for PCBs. But it was based on another published distribution of organic carbon across particle sizes.

Elizabeth: The bottom tables are just a consequence of plugging the concentrations into the model. I wanted to know whether the information in the top part has already been documented.

Jeff: yes

Elizabeth: my question was just directed at the top tables. Making sure that information has already been documented. Not to give the impression that this is something we wouldn't consider, more along the lines of what is already in the record so that if something like this is part of the Proposed Plan, we could reference it.

Jeff: I think these actual run results are not in the published final document. Every run we did is not in the report, so these numbers are from a presentation to the modeling team as we were exploring parts of the model, but it is done with the final particle size distributions that we used in the final report. It's presented by total mass rather than individual particle size in the final report.

Bill: so for the upper right hand box entering the EW, that is actually what is leaving the LDW, and could enter the EW and WW?

Greg: correct

Bill: for the bottom tables, is there a function from above?

Debra: can you walk us through an example Greg?

Greg: so, this 14 ug/kg for example (from the Green for PCBs) is based on the surface area from above (14%). So, your contamination is assumed to be distributed evenly by the surface area, then you divide by mass to get to a concentration.

Jeff: So, can you explain how 1b changes for entering the EW?

Greg: using 57 ug/kg for PCBs, we assume that it doesn't change as it gets transported to the EW. When it leaves the LDW, it's actually 56% of the mass of total suspended solids rather than 17% of the suspended solids mass.

Merv: I think it would be good to send the spreadsheet over to Bill.

Bill: it would be helpful to see it, but I want to make sure everyone understands that the values at the bottom have been normalized from above.

Greg: yes, surface area goes into identifying the initial concentrations of the class sizes, and then the last step is based on mass.

Jeff: if you focus on PCBs, this method applies to organic carbon because that is where organics attach. This is why we have the concern about treating all particles the same because concentration by particle size varies dramatically, and this is the best way we have seen in the past that represents that change. It's based on data that's been collected and matches up well with other studies that shows particle size distribution with different chemicals. So, this is our concern with using the upstream data without some sort of factor for what's leaving the LDW, as that is different than what is at river mile 10.2.

Bill: so as the particles are travelling down the LDW, the larger particles are dropping out, so the relative importance of the fines is increasing and it contributes higher concentrations to the total.

Jeff: yes. It's important to recognize all particles settle in LDW, but only 1a and 1b continue to leave the LDW. We just don't know how much of each particle size class that enters the EW would actually settle.

Merv: but what settles in EW isn't necessarily the question we're trying to solve. What you're getting is an enrichment of the finer fraction as you flow down through the LDW. It's an enrichment of the finer fractions at the expense of the coarser fractions that shifts the weighted concentration.

Elizabeth: do we have any information that tells us how close this calculation is to actual suspended sediment?

Greg: great question. I would like to analyze that further. We can compare based on the sizes in Green River data to our suspended sediment data. We are going to have to crunch some data but that is a good question.

Merv: At a minimum, this analysis is a credible line of evidence that suggests that using just upstream suspended sediments without fines adjustment will likely bias calculations of AB low. The pathway we're currently on would be biased low.

Greg [Slide 10]: I call this method we just reviewed fines normalized modified, but it is probably not a great name. Arsenic is not presented for the new method as it's not organic, but for D/F and PCBs it has a bigger effect than the prior fines normalization method. Merv is right that this is important to the conceptual site model.

Ravi: I think this requires some more internal discussion. Elizabeth would you agree?

Elizabeth: I agree, but I'd like to see some additional data. This is a significant thing. The question we're being asked to consider is whether this is a line of evidence that could be part of a sensitivity analysis or is it the part that goes into the base calculation approach in the cleanup document?

Ravi: well maybe you could provide the additional information Greg and we could potentially provide a response by the January meeting. We could at least include it as part of the sensitivity. Would you agree Elizabeth?

Elizabeth : yes, it's my impression that is EWG leaning more towards using this as the basis for the AB calculation?

Merv: that's a good impression

Jeff: at a minimum it's explaining the significance of not doing something and the issues with using just upstream suspended solids data as is.

Elizabeth: it's a question of whether just using the upstream data is representative of what's entering the EW. The more information we have to answer that question, the better.

Merv: that's fair

Ravi: can you provide us additional information?

Greg: yes, we'll provide the calculation spreadsheet and also a comparison of the Green River grain size data with the grain size categories from the model

Ravi: does that sound good Elizabeth and Bill?

Elizabeth: yes

Bill: yes

Greg [Slide 12]: we added the word "not" to the first bullet as it was a mistake in the version we emailed last night. EWG agrees that 17 mg/kg represents arsenic suspended sediment in the Green River, but it doesn't account for biogeochemical reactions that take place in sediment. The leading candidate is the biogeochemical reactions of mobilizing arsenic in dissolved form under reducing conditions. For the second bullet, we could present other lines of evidence from upstream, previously cleaned up remediation sites that are nearby and what is in Elliott Bay. This could provide context to the suspended sediment value or it could be used to estimate AB for arsenic.

Merv: we have arsenic boxed in pretty well. We have an estimate of NB of 7 or 11 mgkg depending on which statistic you use. 7 mg/kg came from EPA, and 11 mg/kg came from Ecology using a slightly different statistic. We have bedded sediment that we presented last time that are right around 9, 10, and 11 mg/kg. But we are talking about pretty small differences between what NB is and what AB is. So, if there is a way to use these multiple lines of evidence to come to a very credible estimate of AB, that's what we're looking for.

Debra: Elizabeth, Bill, Ravi, do you have any thoughts? The 17 mg/kg is in suspended solids, but sediments in EW and LDW and in Elliott Bay, they're all showing lower arsenic than that.

Ravi: sorry I missed what Merv said because I lost the meeting.

Merv: We have AB for background for arsenic relatively well boxed in; it seems to me that the aggregate lines of evidence we have could be used to make a very credible estimate of AB for arsenic plus or minus 1 mg/kg. If there's a way to use these multiple lines of evidence to acknowledge that we have a disparity about what's coming in from the Green River with what's downstream in EW and in Elliott Bay.

Bill: so are we thinking that this is part of a sensitivity analysis, or that it is part of an actual definition of background. Our choices are to use 17 mg/kg from the Green River, or adjust it down to account for biogeochemical reactions.

Debra: yes, that's what we want to talk about.

Elizabeth: I have been in this career for 30 years and thing I can count on one hand number of times when the PRP came to me and said the CUL was too high. There is nothing that precludes us from including this information, but bedded sediment from somewhere else is a different dataset. The work will fall on you to assemble that data and justify these calculations. There is nothing that precludes anything you suggested.

Merv: so what's EPA's decision of what AB should be for arsenic based on where we are today?

Elizabeth: I don't know that we have a position. We all agreed we would use this suspended sediment dataset and here is a situation that, unlike the organic compounds, the suspended sediment dataset is not matching what we have pre-remedy. I could ask a biogeochemist. This would be more documentation about what is happening.

Pete: so what I'm hearing is that we're all on the same page that arsenic is different than the other chemicals. But that it's kind of up to us to craft what we think is a reasonable and defensible number. Is that right?

Elizabeth: yes particularly if the 17 mg/kg is not defensible.

Jeff: We think 17 mg/kg is a decent number for what is coming in, but it changes to something else after it's deposited.

Elizabeth: so you would argue 17 mg/kg is coming in, but some other process is changing what is present in sediment. Did you use 6020 or an ICP method for arsenic?

Debra: we may have used ICP, but it is total arsenic we measured.

Elizabeth: I'm not sure what chemistry is happening in the sediment that affects the extraction, so that would be part of the theory about why the total arsenic captures it all.

Debra: they are the same chemical methods for upstream vs EW sediments, but we are in marine water versus freshwater. But what's more important is that a fraction dissolves and it appears lose some arsenic.

Merv: yes, that's it. So, it sounds like we have to plow forward with the information we have. If EPA wants to get back to us that's great but you are sort of just putting it into our hands.

Elizabeth: you're not saying anything that I can't accept, and you haven't said anything that catches my hair on fire, so it's fine.

Bill: this is a good process to go through. In this case, we understand arsenic is different than some of the other compounds. Trying to apply our deeper understanding of the process that arsenic is going through is good, but when we apply this to a cleanup level, it is still a bit of a black box. What

is the meaning of a cleanup level of setting it at 12 mg/kg and then it ends up being 15 mg/kg? We'll have to understand why is it 15 vs 12 mg/kg down the line.

Greg: we have ten minutes so need to move on, but this has been productive. So the path forward is EWG has to hone its analysis.

Ravi: we will be talking about it internally, so let's move on.

Greg [Slide 14]: it would probably be helpful for EPA to read these bullets to see if they have thoughts on these sensitivity runs.

Debra: Dan will send out a revised set of bullets, so please read the revised slide

Greg : correct.

[Slide 16]: here's our proposed memorandum outline. For item 3, we would review all the data we reviewed and how we honed in on the data we are using going forward. Item 4 is the description of the actual Green River dataset. Item 5 is a brief section on the actual calculation. Item 6 would have more information on the additional analyses we completed. We believe this is the starting place for our large group meeting agenda. Any preliminary feedback?

Elizabeth: this is fine with me

Ravi: looks pretty self-explanatory to me

Bill: so next we could see an annotated outline that could happen before the next meeting with the larger group:

Ravi: I would agree. Alison, do you have any comment?

Alison: no comment now

Greg: so can we discuss the large group meeting?

Dan: we're expecting to review what we've completed to date and report out to the larger group what we've completed in the small group. Does EPA prefer that EWG lead that meeting? And would you like to collaborate before the meeting?

Pete: sounds like you are going to talk internally about arsenic so we would want any follow up information you generate from that. What material do you want us to include in the large group meeting?

Ravi: I would expect EWG would take the lead in the large group meeting. We would also have a meeting with upper management before then. We'd like an annotated outline before the end of the

month. We can talk about what we have consensus on, but I would not compare to differences between Ecology's approach and not compare or reference to LDW as CULs those are different and final.

Debra: I am wondering, Ravi, we assumed but didn't make clear, if we draft a presentation we would share it with you and get feedback from you prior to the January meeting?

Ravi: that sounds good

Elizabeth: that would be appreciated. This has been really a consensus process. I view it as information for them to review what we have done.

Ravi: Alison does that sound OK to you?

Alison: are we having an internal meeting before that happens or are we all reviewing independently?

Ravi: we'll probably have an internal meeting before then, maybe a couple.

Merv: Greg, you mentioned that one approach would be to use the memo outline as a topic guide for the larger group meeting. We could review where we started and through the entire process. Elizabeth suggested we describe what we were asked to do, what we did, and what we came up with, which is more abbreviated. Where do we want to be?

Ravi: I don't think we need to do too much review of the large group meetings. Let's summarize what we agree on and list what we still need to do. I believe we will have some HQ staff.

Debra: I tend to agree, we can't do the full review, so this outline is a guide, but we will focus on what is more important, which is why we want to share a draft presentation with you.

Elizabeth: We made it through items 1 through 4 in the outline with the larger group. We should present the draft numbers. The larger group decided that a suspended sediment dataset is the best way to go.

Debra: that will help focus the discussion.

Pete: from EPA, are we expecting feedback on the grain size piece and on arsenic?

Elizabeth: we will review the additional information on grain size to support our internal discussion.

Ravi: So, we're expecting an annotated outline, notes, and fines normalized information

Greg: Yes, and a draft presentation before the January meeting

Debra: And a bit more info on the D/F congener specific RBTCs

Ravi: It could be useful to get it by the end of the month, that's great, but the presentation could come in January

Alison: on the notes, can you please put in a bit of detail on the arsenic discussion we had today?

Dan: yes

Ravi: Thank you for the discussion. This has been really productive. Have a great holidays.